**NOVEL ITERATED FUNCTION SYSTEM FRACTALS**

HART TRAVELLER

ABSTRACT: In this article, we investigate a novel class of fractals generated from iterated function systems. We demonstrate a function that can generate previously unknown fractals. We also show how seemingly disparate combinations of rules and functions as inputs to and iterated function system can converge to similar, or in some cases the same fractals.

KEY WORDS: Iterated function system, chaos, fractals, simulation

1. INTRODUCTION

In order to provide context for the topic of the paper we will first provide an explanation of the iterated function system (IFS). An IFS consists of x things

* A set of edge vertices in n-dimensions
* Function that accepts two points and parameters
* Ruleset for application of function
* A starting point (arbitrary)

For instance, take the archetypal Sierpinski chaos game.

In this game we have n+1 vertices in an n dimensional space, where our vertices are not collinear and n is greater than or equal to two. For instance – three vertices forming an equilateral triangle on a two-dimensional plane.

In the game, our function f takes in two points A and B, each represented as one dimensional matrices where the length of the matrix denotes the dimension of the space the point is placed in, and outputs the coordinates of the point that is exactly half way between the two input points.

The ruleset for the

Explanation of chaos game

does the function blow up to infinity - iteratively run, check distance from origin and graph for each step, run may simulations and graph

CONCLUSION

Historically, different fractal permutations have been generated by modifying the set of vertices, and the ruleset for the application of the function, but the same function – one that takes in point A and B and parameter d (for the distance between the two points), has always been used. In this paper we show that by modifying the function in the synthesis of the iterated function system, we can generate novel fractals, or in some cases come upon the same fractals we have seen before, though we reached them through wildly different rulesets and functions.

More research is needed into the nature of the state space representing the potential combinations of rulesets, functions, and vertices, the locations on that states space that converge to form fractals, and the relation between the locations on the state space that form the same or similar fractals. Also, the use of novel functions to generate different and unseen fractals

For fractals, perhaps use Bezier curves as midpoint functions?